BULLETIN No. 12. Issued October, 1918.

FORESTRY COMMISSION, N.S.W.

DISEASE IN FOREST TREES

CAUSED BY THE

LARGER FUNGI.

BY

EDWIN CHEEL,

Botanical Assistant, National Herbarium, Sydney,

AND

J. B. CLELAND, M.D.

SYDNEY:
WILLIAM APPLEGATE GULLICK, GOVERNMENT PRINTER.

1918.

Bulletin No. 12.

Issued October, 1918.

FORESTRY COMMISSION, N.S.W.

Disease in Forest Trees caused by the Larger Fungi.

BY

EDWIN CHEEL, Botanical Assistant, National Herbarium, Sydney, and
J. B. CLELAND, M.D.

As far back as 1881, the Rev. J. E. Tenison-Woods and F. M. Bailey (*Proc. Linn. Soc. N.S.W.*, vol. 5, p. 50, 1881) called attention to the great importance of the study of fungi in a young country like ours which depends so much upon its natural resources. In their list of fungi enumerated in the above-mentioned paper, quite a number of the larger ones were recorded which are found in the close dark scrubs and open forests on rotten trunks and decaying trees as well as on burnt surfaces with much charred wood, and on the bark of trees.

Although attention has been called to the fungi found on the above-mentioned substrata, it is not generally known that many of these apparently innocent-looking fungi are frequently the cause of rot in the heart-wood of living trees, as well as of the decay of stored timber and even of fence-rails and wood used as flooring in buildings, &c.

One frequently meets with fallen trees in the forests, but very rarely enquires into the cause of their fall. If we stop to examine further it will be found that in many instances the parts of the fallen logs which were severed from the remaining up-standing trunks are more or less permeated with the mycelium or so-called "spawn" of some fungus. This mycelium is the vegetative stage of certain fungi and has caused disintegration of the tissues, or even converted the solid timber into diseased and decaying matter.

This mycelial stage of the fungus eventually develops a sporophore or bracket-like protuberance such as one frequently finds on the trunks of living trees or on fallen logs. These bodies are of various shapes and colours, but usually of rusty-brown or white. Some of the bracket-like excrescences are known to bushmen by the name of "punk." The most common forms belong to the family Polyporaceæ, and are the receptacles in which are contained the millions of spores which are analogous to the seeds of flowering plants. When the spores germinate they develop thin mycelial

*35839—A

threads or hyphæ, which eventually penetrate the wood cells and gradually destroy them. This causes disintegration and ultimate decay of the parts affected and may finally result in the overthrow of the tree itself during strong wind-storms.

In addition to those fungi which cause heart-rot of living trees, or decay in lumber or stored timber, there are other forms which cause root-rot. Such are the "Honey-coloured Mushroom" (*Armillaria mellea*) and *Polyporus Hartmanni* and *P. Schweinitzii*. The mycelium of these latter forms or species grow in the living tissues of the roots, where they bring about changes which ultimately result in the death of the shrub or tree. Of these the "Honey-coloured Mushroom" is one of the worst. Its long strands of mycelium, commonly known as "shoe-string," grow between the bark and the wood in a short time after infection, and kill the delicate bark and cambium cells. As a result the tree dies from lack of nourishment though the wood is not injured.

Other fungi which cause disease may do so by affecting the living parts so that they cease to perform their functions, or they may destroy the dead supporting parts so that these can no longer maintain the living wood and the leaves. In any consideration of the life and growth of trees one must not forget that every tree, after it has reached a certain age, which varies with different species, is composed of two distinct parts, the living part and the "dead" part. The former consists of the leaves, the younger branches, and the smaller roots, and of a thin layer including the most recently formed wood and the inner bark, while the latter includes the old wood of the trunk, much of the newer wood and the bark. The living parts are renewed at short intervals, while the old wood, known as heart-wood, becomes permeated with certain preservatives and colouring materials, and serves mainly as a support for the growing parts of the tree.

How Trees are infected, and Methods of keeping such Diseases in Check.

Plants usually have natural means for protecting themselves against the attacks of fungi—such as the cuticle or skin-like surface of the leaves, thick bark, and the exudations of gums, resins, &c. But wherever a break is made in these natural protections, insects and fungi are liable to enter. These wounds, by which the spores of fungi may enter, are caused in various ways such as, for instance, by native bears and opossums, by birds of various kinds, more especially the woodpecker (in Europe) and probably members of the parrot family, and by boring insects. The latter are probably the worst, as they make passages by which the fungus threads or hyphæ may penetrate deeply.

Although a few of the larger bracket-like fungi may be regarded as true parasites, a large number of the fungi causing disease in trees may be considered only as "wound parasites," *i.e.*, they can only grow in the heart-wood of the living trees, thus rendering the wood unfit for commercial purposes, after the way has been paved by other agencies. It has been suggested that, when infection brings about the changes described, the rapid disintegration of the cellular tissue is brought about by the secretion of poisonous substances in the tips of the fungous hyphæ. These poisons kill the cells of the host in their immediate neighbourhood, somewhat in advance of the tips of the hyphæ, which subsequently in the course of their growth

reach these dead cells and feed on them in a saprophytic manner. A good example of this is the secretion of oxalic acid in the hyphæ of the Botrytis stage of species of *Sclerotinia*. Very many fungi give rise to crystals of calcium oxalate, apparently as a waste product, these either being stored inside the hyphæ of the fungus, or being formed on the outside of the hyphal wall. A much more remarkable instance of this secretion of a poison is furnished by a fungus known as *Stereum purpureum*. This causes a disease known as "silver leaf," affecting plums, peaches, apples, pears, laburnums, and the Portugal laurel. Some recent work on this fungus by Mr. Spencer Pickering has been published in the Twelfth Report of the Woburn Experimental Fruit Farm—a short account of this appears in the *Gardeners' Chronicle* for 12th November, 1910. The mycelium of the fungus lives in the branches only, and does not appear to extend to the leaves. It secretes a poison, however, which is carried to the leaves of the host plant by way of the wood and the leaf veins; this is produced in sufficient quantities to cause a material alteration in the appearance of the leaves, viz., to turn their colour from green to silvery or ashen grey. Lime or calcium carbonate, if absorbed by the roots and present in the water carried in the wood, would neutralise the acid, with the formation of calcium oxalate. *Colletotrichum glœosporoides,* known as the withertip fungus of citrus trees, found in Florida and other places, similarly attacks its host by means of a poison. The leaves in this case turn yellow.

The treatment for these various diseases should be preventative. All sporophores (bracket-like fungus protuberances) which form on the trees should be destroyed by burning them. Still better, all such diseased trees should be removed, as they may give rise to sporophores which escape notice. Their retention as periodic spore bearers is fraught with grave danger. It is also advisable to cut trees after they have reached a certain age, as old trees are more liable to attack than younger ones, the liability increasing with age.

Agaricaceæ (Gilled-Fungi).

Though the gilled-fungi, of which the common mushroom is our best-known representative, are very numerous and many grow on wood of various kinds, fortunately only a few are of definite economic importance from a forestry view-point. The fleshy species occurring on the ground have obviously no connection with our present aspect unless, as in the case of *Armillaria mellea,* they spring from mycelial threads attacking roots. The majority of the kinds found on wood in the bush are destroying useless lumber and, so far, are useful. The following species are those most important to us in Australia as destroyers or injurers of timber-trees.

Armillaria mellea, Vahl.

The Honey Fungus (Plate I).

This is a very destructive parasite of the roots of trees and its recognition is therefore very important. Not only does it destroy timber-trees of value, but its presence in a forest is of danger to the fruit trees of surrounding orchards. It may be readily recognised by the following features:— It is of clustered habit, growing at or near the bases of trunks; the cap, which may be several inches wide, is somewhat honey-coloured and sprinkled with small blackish-brown warty scales; the gills tend to run down the stem,

and are fleshy-white then brownish in colour; the stems are dingy, rigid, and have often a dull greenish mouldy appearance whilst there is a *more or less well-marked ring* on the stem a little below the attachment of the gills.

The following is its technical description, given in full owing to its importance:—

"Pileus 2-5 in. across, disc fleshy, remainder thin, convex, then expanded, often becoming more or less depressed at the centre, often sooty or covered with olive down when young, soon becoming paler, usually ochraceous with a tinge of honey-colour, sprinkled all over with small, spreading, blackish-brown scales, margin striate; gills adnate, then becoming more or less decurrent, rather distant, white with a flesh tinge, then brownish and powdered with the white spores; stem 3 to 5 inches long, 3 to 6 lines thick, rigid, more or less grooved, dingy ochraceous, floccose or almost naked below the ring, base often covered with yellowish down, stuffed then hollow, elastic; spores elliptical, 9 x 5 to 6 μ. At the base of trunks or on the ground.

Exceedingly variable; usually densely cæspitose (*i.e.*, growing in a bunch) when growing at the base of trunks; larger when solitary or almost so, among leaves on the ground. Sometimes the stem and pileus are suffused with a yellow or orange tint, which at other times is entirely absent, leaving the pileus dingy ochraceous; stem and pileus sometimes almost or quite glabrous, especially when old."—Massee.

It is very common in the Sydney district during the months of May and June, being found at the bases of Eucalypts and various introduced cultivated trees. In the Botanic Gardens it has been found at the base of *Elæagnus pungens,* and on trunks of "Weeping Willows" (*Salix babylonica,* L.). We have collected numerous specimens of this species from dense tufts at the base of trees at Mosman, Sydney, at Terrigal, and at Kendall, near Wauchope, usually in May or June. The stems of many specimens present a dull greenish mouldy appearance. The spores vary from 7 to 10·3 μ x 5·2 to 7 μ.

The mycelium is somewhat flat and resembles shoe-strings, hence it is sometimes called the "Shoe-string Fungus," and is found beneath the bark of trees in flattened strands, and also runs long distances through the ground and attacks the roots of trees. In some districts this fungus is a serious pest, especially in newly cleared land. In order to check its spread it is necessary to keep the land thoroughly free from decaying roots of trees and timber, as these frequently encourage the development of the sporophores. The sporophores together with the timber and roots should be burnt so as to destroy the spores or portions of the strands of mycelium which may be in the timber. If the land is low and requires to be drained, it will be advisable to use pipe-drains, as bush drains aggravate the trouble. In some localities, where the fungus is very prevalent, it is advisable to grow a crop or two of cereals, potatoes*, &c., before planting fruit trees. It has also been found advisable to avoid ploughing in green manure crops as the decaying vines may assist in propagating the fungus.

---

*Although this fungus has been known to attack potatoes, the object of advising potato culture before planting trees is to permit of the scarifier or other implement being used freely between the drills so as to expose and eventually destroy the mycelium.

Pholiota adiposa, Fries.

The Sticky Timber Pholiote. (Plate II.)

This remarkably handsome brown-gilled agaric should be easily recognised from the plate, and by the fact that it is found attached to the sides of the trunks of the affected trees, up to a height of 20 feet or more. In Europe it is considered a destructive timber parasite, the positions in which the fruiting "toadstools" appear indicating the distances to which, at least, the fungus threads have extended in the tree, destroying the wood correspondingly. So far the fungus has only been met with in one situation in New South Wales, namely, in dense forest at Mount Wilson. The trees affected were probably coachwood. It is also recorded for Queensland. As a number of European trees are grown in the neighbourhood of Mount Wilson, the fungus may have been introduced there with one or more of these, or it may, of course, be a rare native of Australia. In any case it does not seem to be widely distributed, and it would be a wise course to make every endeavour to exterminate it entirely by cutting down and burning all trees infested by it, thus destroying the fungus threads which annually produce new fruiting bodies to perpetuate the species.

Polyporaceæ (Pore-Fungi).

A number of the pore-fungi in general appearance somewhat resemble the Agaricaceæ or gill-fungi, but may be distinguished by having the spores borne in the inner surface of tubes or pits.

In the most typical forms, comprising such genera as *Boletus* and *Polyporus,* the texture is more or less fleshy, and the tubes collectively forming the hymenium are frequently 2 to 3 centimetres long; and vary in different species from 0·5 mm. upwards in diameter.

In the highest types the tubes are cylindrical and are packed compactly side by side as seen in a vertical section, whereas when viewed in the entire plant the pores or openings of the tubes only are seen. The form of the pores is circular when the tubes are cylindrical; in other instances the pores are polygonal, or sinuous when somewhat elongated, or wavy or flexuous. In some genera such as *Poria,* the tubes may be so very shallow that they merely resemble circular, polygonal, or sinuous pits or depressions. The bordering walls of the tubes, which bear the hymenium on their free surface, are called "dissepiments." The elements of the hymenium consist of basidia and paraphyses, and in many instances large cystidia are also present in considerable numbers.

The family includes a large number of species commonly known as "bracket" or "shelf" fungi, which are frequently found on fence-rails, tree-trunks, and decaying logs, and several of these are very destructive to timber. For instance, the felt-like masses of mycelium of certain species of *Fomes* and *Polyporus* are frequently found coiled around the heart-wood of several species of our Eucalypts and Acacias.

The genera into which the pore-fungi are divided may be briefly described as follows:—*Boletus* and *Strobilomyces* comprise fleshy putrescent species, chiefly growing on the ground, and do not concern us as timber-destroyers. The species of *Polyporus* are more or less firm and leathery and do not readily decay; though some are stalked, they are usually attached by one side in bracket form and have a well-defined upper surface

and a lower, pore-bearing, surface; the tubes are sharply defined, but are not separable easily from the flesh; some of the species are very large and, by their mycelium ramifying as fungus threads through the woody tissues on which the fruiting bodies (the pore-bearing bracket fungi) are borne, are often very destructive to timber. *Polystictus* is similar, but the substance is thin and tough, leathery, or even papery. In *Fomes,* the species are more or less perennial, producing during each growing period a fresh layer of pores superimposed on the preceding layer; their substance is hard and woody; many species are large and destructive in the same way as some species of *Polyporus. Ganodermus* is separated from *Fomes* by having a crust which is more or less smooth and shining (laccate, lac-like), and by having peculiar coloured spores. In *Poria,* there is no definite separation of upper and lower surfaces, the fungus lying exposed on the surface on which it is growing and being composed of short pits or pores. *Trametes* is like *Polyporus,* save that the tubes penetrate to different depths in the flesh instead of all ending at one level. In *Hexagona* we have forms like *Polyporus,* but the tubes are more or less polygonal rather than rounded. Similarly, in *Dædalea* the tubes are elongated and sinuous, being in fact not true tubes, but the first stage towards the gilled type seen in Agarics such as mushrooms. In *Merulius,* to which genus a common dry-rot fungus belongs, the fungus is spread out as in *Poria,* but is subgelatinous, and the pores are represented by shallow irregular pits or folds.

Polyporus.

The following are the most important timber-destroying species of this genus recorded for, or hitherto found in, New South Wales.

Polyporus squamosus, Fries.—This species is obviously rare in Australia, but this is an additional reason, considering its destructive action on the trees that it attacks, why it should be specially searched for and its fruiting bodies destroyed, together with any infected host, so as to prevent further spread. Its cap is described as being broadly fan-shaped, fleshy, pliant, and dingy pale yellow or pallid, being variegated with large brown adpressed scales. The pores are short, variable, and pallid. The stem is excentric or almost lateral, short, thick, and with a black base. It sometimes attains a relatively enormous size.

Polyporus portentosus, Berk.—A very large species, characterised by having a thin tan-coloured skin on its upper surface; its substance pure white, fragile, and chalky; and its pores white. The species seems to be rare in Australia and, though hitherto found on fallen timber, probably attacks living trees.

Polyporus eucalyptorum, Fries. (Plates XIII, XIV, XV.)—This species can be readily recognised by its "punky" characters. The dried fruiting body, which is often found on the ground much channelled by insects, having fallen from its original site high up on the butt or branch of a tree, is popularly known as "punk," and forms excellent tinder, taking several hours to burn away. When removed in the growing state from the tree it is usually more or less hoof-shaped, has a thin skin delicately coloured in greyish-brown tints, white flesh, and bright almost canary yellow pores (in some specimens we believe the pores are white). This fungus is very destructive to the Eucalypts it infests, the heart-wood being decayed and

penetrated by the mycelium which often forms extensive flat white sheets of the consistency of chamois-leather. Once attacked and penetrated by this perennial mycelium, the tree affected will annually produce a bracket-fungus from which spores are detached to affect other trees. Consequently every tree on which the fruiting body appears should be marked and cut down—the tree is already useless itself and a danger to others from each new fungus fruit borne on it.

Polyporus fumosus, Pers.—This species is met with growing in dense masses more especially on stumps. The masses consist of small bracket fungi growing one on top of the other and more or less overlapping. Sometimes the brackets are appreciably thick, sometimes thin and pliant. The upper surface is pallid with a smoky tinge and silky becoming smooth. The flesh is pallid. The pores are shallow and pallid and dry with a distinct smoky tinge. It plays an undoubted part in destroying useless stumps, and as it is said to grow sometimes on trunks will have a similar destructive action on these. Its practical importance is, however, apparently not great.

Polyporus ochroleucus, Berk. (Plates XII*a* and XVI*b*.)—This species can be readily recognised as being the small, pale, yellowish-brown or biscuit-coloured, bracket fungus found commonly on posts and fences. In these situations, its mycelium penetrates the substance on which it is growing, causing a slow rotting. We recently found a telegraph post in North Sydney extensively attacked by this fungus. Its base was evidently rotting whilst numerous small brackets were developing, to shed their spores, for a distance upwards of at least 10 feet. We have not found this species attacking living trees, but it unquestionably causes some definite monetary loss by its attack on fences and posts. It is probably too common to combat successfully, but its spread may be somewhat diminished by systematically collecting and burning the sporophores. Where possible affected rails and posts should be removed and also burnt, so as to prevent further crops of fruiting bodies.

Polyporus gilvus, Schwein. (Plate XI*a*.)—This is a common species on stumps and at the base of trees. It is attached by its side and often a number of fruiting bodies overlap one another to form an extensive patch. Its upper surface is brown and slightly wavy; the substance a bright yellow ochre to cinnamon brown; and the pores small and brown. Its thinner pileus and less woody structure distinguish it from such species as *Fomes robustus* and *F. rimosus,* which it, rather remotely, resembles. This species probably confines its damage to worthless material such as stumps rather than to the larger living forest-trees.

Polyporus dryadeus. (Plates *Xa* and *b* and XI*b*.)—Though hitherto only found in this continent on a Eucalypt in South Australia, this species and its close ally, *P. rheades* (*P. dryophilus*), are so destructive to the hosts on which they occur that special attention must be directed to it so as to check any further spread should it already occur in our forests. The mycelium attacks the heart-wood of the tree whilst the brackets appear, often out of reach of the ground, on the sides of the trunk. Our Australian specimens are wedge-shaped, being about 2½ inches high at their attachment and extending forwards 3 inches. The upper surface is a light-brown, somewhat zoned and nodularly irregular. The substance is firmish and

reddish-brown and with an indefinite whitish mycelial core. The pores are up to half an inch long, whitish at their openings and nearly the colour of the context on section. The upper surface of the bracket is horizontal, and so, from its wedge-shape, the under surface bearing the pores descends in a convex fashion from the slightly inturned edge of the cap to the attachment.

Polystictus.

The species of this genus are distinguished chiefly by the substance of the sporophore being thin, tough, leathery, or papery. The upper surface of the pileus may be silky or hairy, and the flesh is quite thin and the tubes are short and not stratose.

The most common species are *P. cinnabarinus, P. sanguineus, P. versicolor,* and *P. hirsutus,* all of which are found on fallen logs and on stacked timber as well as on fence-rails. As the substance on which they are found is usually permeated with the mycelium of the respective species, it is quite clear that these species cause a rot and as a consequence a rapid decay of valuable timber. All sporophores should, therefore, be destroyed by burning.

Polystictus cinnabarinus, Jacq.—This is easily recognised by the bright cinnabar-reddish coloured brackets which are usually about 3 to 4 inches wide, and ¼ to ¾ inch thick. It is very common in the Port Jackson district, and is sometimes called "Red Indian's Ears." It has not been found attacking living trees. There are upwards of fifty collections of specimens represented in the National Herbarium, which have been gathered from various kinds of timbers, including *Melaleuca styphelioides, M. parviflora, Banksia* sp., Ironbark, Red Box, and Peach Trees.

Polystictus sanguineus, (L.) Meyer (Blood-red Polystictus).—This is very similar to *P. cinnabarinus,* but is much thinner in texture and is usually found in our warmer and moister districts.

Polystictus versicolor, Fr. (Plates XVI*c*, XVII, and XVIII).—This is a very variable species found in nearly every part of the world. It is usually found in dense clusters on wood which, as a rule, is permeated with the mycelium and quite rotten. Whilst usually attacking fallen timber and stumps, we have seen, near Morpeth, in the Newcastle district, many rails of a fence rendered quite rotten and almost useless by an extensive infestation of the fungus. The species can be readily recognised by its thin, pliant nature; its velvety upper surface, beautifully variegated by zones usually from a dark-grey or bluish-grey to whitish colour; and its minute creamy whitish pores.

In the National Herbarium, Sydney, there are quite a large number of specimens from the Port Jackson district and Blue Mountains. There are also specimens from Burrinjuck and Cobar.

Polystictus hirsutus, Fr.—This species closely resembles the preceding, its upper surface being more hairy.

Fomes.

The following are the most important timber-destroying species of this genus known in New South Wales. The species of *Fomes* are characterised by their firm wooden nature and perennial habit manifesting itself in successive layers of tubes.

Fomes hemitephrus, Berk.—This is a fairly common species. It is occasionally hoof-shaped, but usually flattened and extended (applanate) and, until cut into, superficially resembles *Fomes applanatus.* Its inner texture, however, is whitish to pallid fawn (isabelline) and not dark reddish-brown as in the latter. Its upper surface is usually more or less concentrically furrowed and shows zones of colour of varying tints from dark-brown to pallid brownish. There is usually an orange stain just under the crust. The pores are minute and their colour more or less that of the internal structure as a whole. We have found this species growing some distance up the trunks of forest-trees, and it probably plays an important part in killing those it attacks.

Fomes robustus, Karst. (Plate IX), ***Fomes Robinsoniæ,*** Murrill (***Fomes squarrosus,*** Wilson), and ***Fomes rimosus,*** Berk.—This group of species is very common and also very destructive, apparently taking the place in Australia of *F. fomentarius* and *F. igniarius* of Europe. Both these lastnamed species have been recorded for New South Wales, but we are inclined to think that the plants so identified were probably really *F. robustus, F. Robinsoniæ* or *F. rimosus.* We have not met with *F. fomentarius* or *F. igniarius* ourselves, and both, if they do occur, must be rare. *F. robustus* is readily recognised as the large, often very large, very hard and heavy, brown-textured, hoof-shaped, bracket fungus found attached to the sides of tree-trunks. We find difficulty in distinguishing, without microscopic examination, between *F. robustus* and *F. rimosus,* but the latter seems to be usually smaller and flatter, microscopically the spores are brown and not whitish, and on section the context colour is a darker reddish-brown rather than the yellow brown of *F. robustus. F. Robinsoniæ* is also very similar to the other two, and we have to use the microscope to differentiate it —this reveals the presence of setæ in the pores, which are rare, if present, in *F. robustus,* and uncoloured spores. The upper surfaces of these three species show in the older part usually a dark-brown, almost black, hard, more or less cracked crust. The younger free edge is a lighter brown passing to greyish-yellow or yellowish-brown at the growing edge. The pore-mouths are very minute.

These three species are all probably highly destructive to our native timber trees—certainly *F. robustus* is. Their mycelia traverse the heartwood, disintegrating it, and, in the case of the lastnamed species, giving it a peculiar speckled appearance from whitish to yellowish-brown. Annually, from these buried fungus threads, a sporophore—the bracket fungus—bursts forth, as it were, through the bark. To prevent the spores from these being distributed to infect other trees, they should be removed and burnt, whilst to stop the tree from annually producing this danger, it should be cut down and destroyed.

Fomes conchatus, Pers.—This is a relatively small species with its substance a brown colour something like that of *F. rimosus.* The projecting bracket portion is often ill-developed, the fungus being consequently more or less effused like a *Poria.* The bracket part, when developed, is usually thin and shell-shaped and, with us, so disposed as to form a slightly concave surface below in which the minute brownish pores develop. Sometimes the bracket is much thicker with a dark rimose crust as in *F. rimosus.* We have found this species killing a peppermint gum (*E. piperita*) and also growing on a she-oak (*Casuarina*).

Fomes applanatus, Pers., and its varieties. (Plates VI, VII, VIII, and XII*b*.)—Though distinctive names have been given to forms of this species, *e.g.*, *F. australis,* Fries., when the tubes are very long and the "substance" above them thin, *F. oroflavus,* Wilson, when the pore-mouths are yellowish and not whitish, &c.,—we believe these departures are hardly entitled to rank as varieties, much less as species, being dependant in great part on adventitious circumstances and probably not breeding true. For practical forestry purposes, at least, they may all be considered together.

Fomes applanatus is one of our commonest species, and probably does a considerable amount of damage. It grows as extensive, relatively thin, brackets at or near the bases of trees. Sometimes these brackets are 1 foot or more in diameter, and several may be close to one another on the same trunk. Occasionally hoof-shaped specimens are found. The upper surface is crusty, usually of a brownish rusty tint becoming greyish when very old, more or less wrinkled (rugose) and somewhat concentrically furrowed. The substance is a rich dark bay brown. The tubes are sometimes quite shallow, sometimes an inch or more in length and of an almost purplish-brown colour, paler than the substance. The pore-mouths are minute and whitish, brownish, or yellowish. The rich dark-brown context colour, on cutting a specimen in two, is one of the readiest means of recognising the species. Often a purplish-brown powder will be found in abundance under one of these fungi when actively growing—this is composed of millions of its spores.

The appearance of the bracket-fungus at the base of a tree is a sure indication that that particular tree is permeated at its base by the mycelium of the *Fomes,* which is interfering with the vital processes at work there. In forests, *F. applanatus* is common at the base of Eucalypts; it also killed a tree of *Acacia horrida* in the Botanic Gardens, Sydney. (Plate VIII.)

Hexagona.

The genus *Hexagona* is distinguished from other polypores by the large, round or hexagonal pores. It is found chiefly in the tropical or subtropical regions, but is occasionally met with in temperate regions.

The context of *Hexagona* is usually of a corky-woody nature, and the colour of the spores white. As specimens of two common species, *i.e., H. Gunnii,* Berk., and *H. tenuis,* Hook., are frequently found on living trees, especially on the silky oak (*Grevillea robusta*), and a eucalyptus, we feel that further investigation is necessary to find out if the various species are parasitic or saprophytic.

Trametes.

The species of this genus are characterised by the tubes extending to various depths and not all ending at one layer, so as to form a definite stratum. Some are more or less perennial, and might be classed with *Fomes.*

The New South Wales species of this genus are probably not of much economic importance, their timber-destroying activities being expended chiefly on dead trees and fallen trunks. Possibly, however, some of the dead trees on which *T. lactinea* has been seen flourishing were killed by this species, when its economic importance would be enhanced. So far we have not noticed it on living trees.

Trametes lactinea, Berk. (Milk-white Trametes.) (Plates XIX and XX.)—This is easily recognisable by forming often extensive brackets, 8 to 9 inches wide and 2 to 3 inches thick, on the sides of dead trees and on fallen logs. The upper surface is whitish to pallid and somewhat velvety, the flesh firm and white, and the pores rather small and white.

Trametes feei, Fries., and ***T. lilacino-gilva,*** Berk.—These are our two most common species with rosy-pink flesh, by which they can be recognised. They probably grade one into the other, being extremes of one type. They are both found chiefly on fallen timber, hastening its decay, and are not of definite economic importance. *T. feei* may extend sideways for a foot or more in length, forming a narrow bracket projecting about 2 inches from its attachment. In our specimens the upper surface is rather smooth and brownish. *T. lilacino-gilva* is not so extended, and its upper surface is strongly rugose and fibrillose, and usually of a coppery-rosy-pink colour.

EXPLANATION OF PLATES.

Plate I.—*Armillaria mellea* (Honey-coloured Toadstool). Two groups, showing the natural habit at or near the bases of trees.

Plate II.—*Pholiota adiposa* (Sticky Timber Pholiote), showing—

(*a*) The upper surface of the cap; (*b*) remnants of the veil and the gills; (*c*) section showing hollowness of the upper part of the stem.

Plate III.—A broken sheet of sterile mycelium of the so-called "Xylostroma," which is probably the vegetative stage of a *Fomes*. The colour is brown mottled with a paler brown. Taken from the hollow trunk ot a *Eucalyptus* at Mount Tomah.

Plate IV.—A broken sheet of sterile mycelium, taken from the hollow trunk of a *Eucalyptus*.

Plate V.—Cylindrical or finger-like forms of sterile mycelium, probably of a *Fomes*, taken from a "Box-tree" *(Eucalyptus)* at Riverstone.

Plate VI.—*Fomes applanatus* var. *australis*. Showing the upper surface of the bracket-like sporophore.

Plate VII.—*Fomes applanatus* var. *australis*. Showing the under surface of the same fungus given on Plate VI.

Plate VIII.—Portion of the heart-wood of *Acacia horrida*, permeated with the mycelium of the *Fomes applanatus* var. *australis*, given on Plates VI and VII.

Plate IX.—Cross-section of trunk of *Banksia cricifolia*, showing (*a*) heart-wood partially destroyed; and (*b*) heart-wood wholly permeated and destroyed by the mycelium of *Fomes robustus*. The bracket-like sporophore is *in situ* in (*b*).

Plate X.—*Polyporus dryadeus*—(*a*) The upper surface of the bracket-like sporophore; (*b*) a section of the same species, showing context and tubes or pores.

The plants were attached about 15 feet up the trunk of a living *Eucalyptus*.

Plate XI.—(*a*) *Polyporus gilvus*. Two bracket-like sporophores in position. (*b*) *Polyporus dryadeus*. Showing the pores of the under surface.

Plate XII.—(*a*) *Polyporus ochrolcucus*. Upper surface of a bracket-like sporophore. (*b*) *Fomes applanatus*. Upper surface of a bracket-like sporophore.

Plate XIII.—*Polyporus cucalyptorum.* A complete bracket-like sporophore attached to the trunk of a "Blackbutt" *(Eucalyptus pilularis)* in the Government Domain, Sydney.

Plate XIV.—*Polyporus cucalyptorum.* Section of timber *Eucalyptus capitellata* permeated with sheets of the white felt-like mycelium, and section of the bracket-like sporophore in position.

Plate XV.—Wads of felt-like sterile mycelium, probably of *Polyporus cucalyptorum*, separated from the heart-wood of a stringybark (*Eucalyptus*).

Plate XVI.—(*a*) *Polyporus salignus.* Under surface of a bracket-like sporophore. (*b*) *Polyporus ochroleucus.* Under surface showing the pores. (*c*) *Polystictus versicolor.* Under surface of a solitary sporophore.

Plate XVII.—*Polystictus versicolor.* A group of superimposed sporophores, in position on portion of a branch of tree.

Plate XVIII.—Section of the branch of a tree, showing the rotting of the timber, caused by the *Polystictus versicolor*, shown in Plate XVII.

Plate XIX.—*Trametes lactinea.* Upper surface of a bracket-like sporophore.

Plate XX.—*Trametes lactinea.* Showing the small pores of the under surface of a bracket-like sporophore.

[We are indebted to the Government Printer for the excellent photographic illustrations. The coloured illustrations were drawn by Miss P. Clarke.]

Sydney: William Applegate Gullick, Government Printer.—1913.

Two thirds natural size

Plate I.
ARMILLARIA MELLEA.

Two-thirds natural size

Plate II.

PHOLIOTA ADIPOSA.

Showing upper surface of cap, under side with gills, and sectional outline.

Plate III.

Sheet of Sterile Mycelium (Xylostroma) from the Hollow Trunk of Eucalyptus.

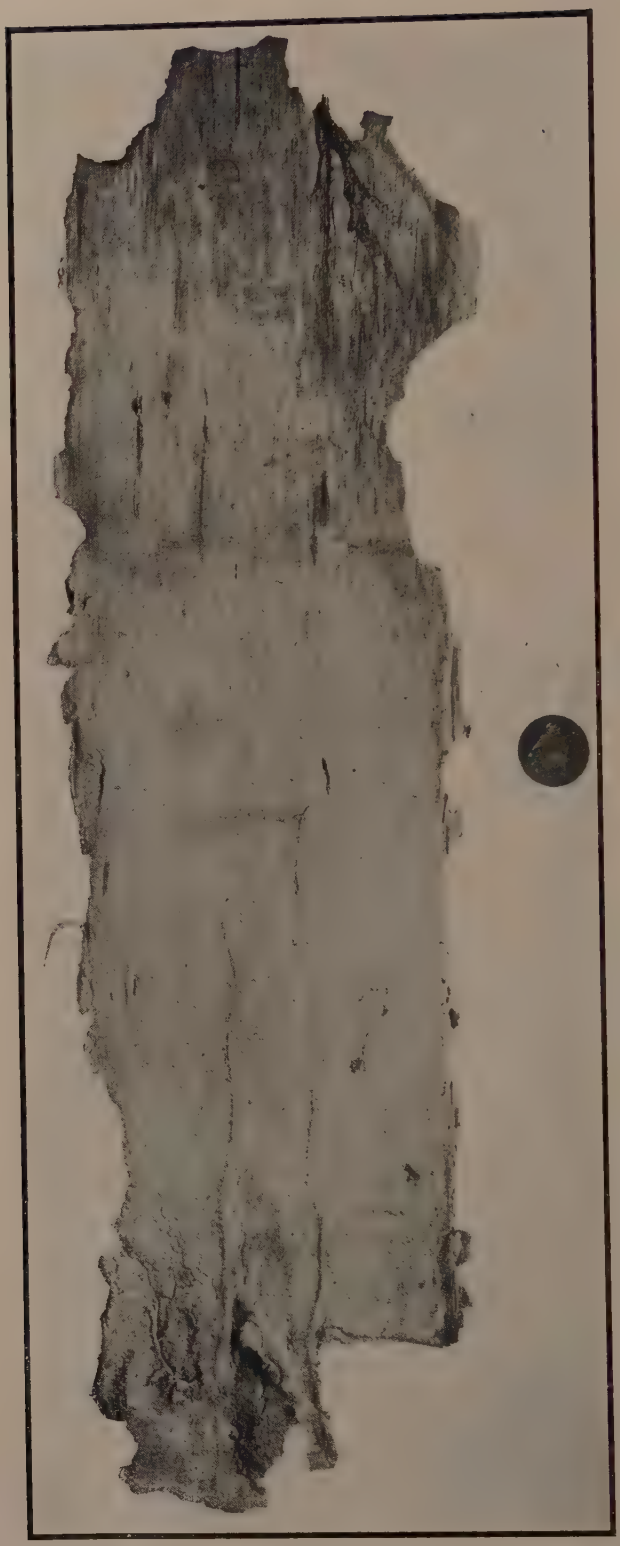


Plate IV.

Sterile Mycelium from the Hollow Trunk of Eucalyptus.

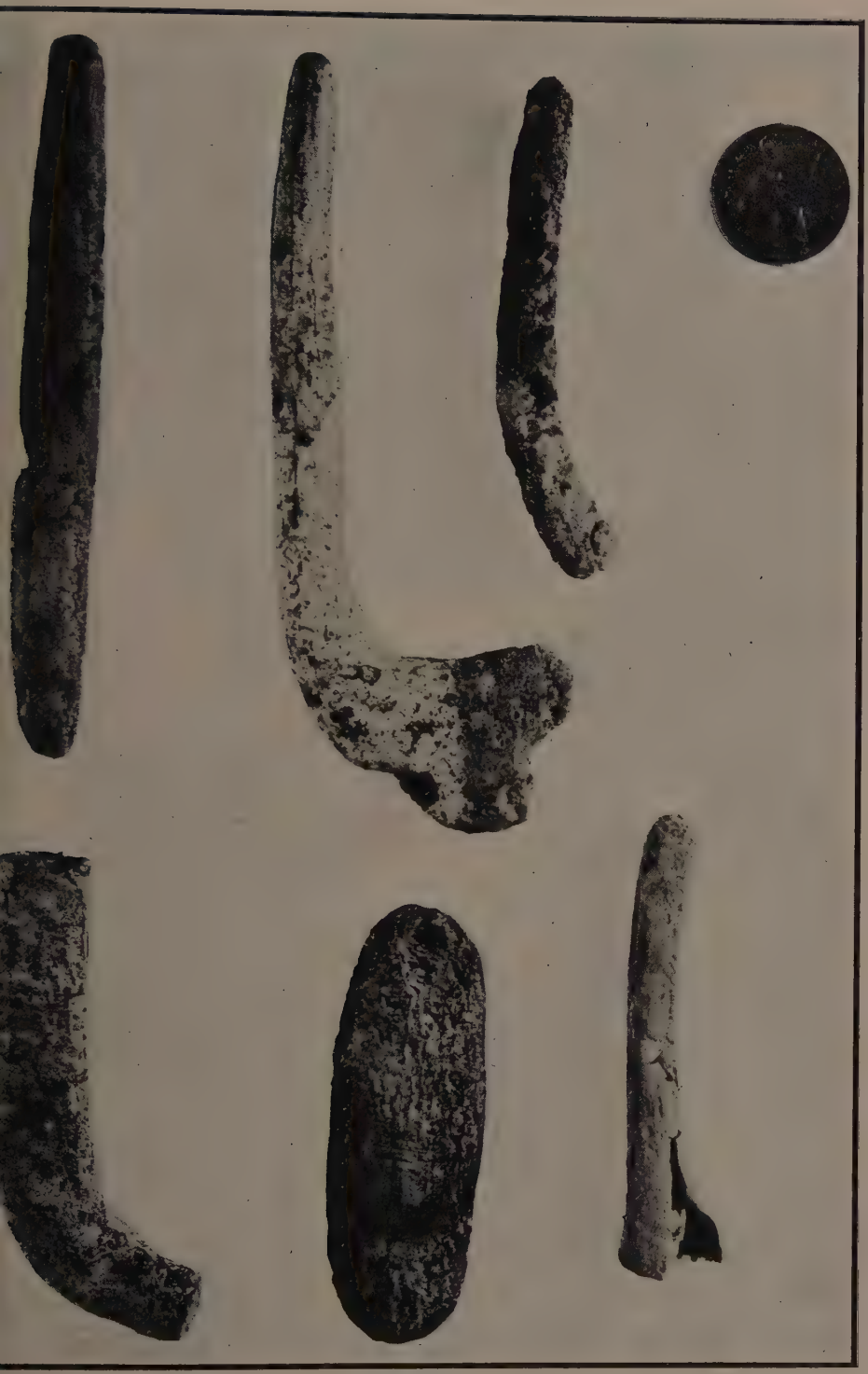


Plate V.

Cylindrical or Finger-like Forms of Sterile Mycelium from a Box (*Eucalyptus* sp.).

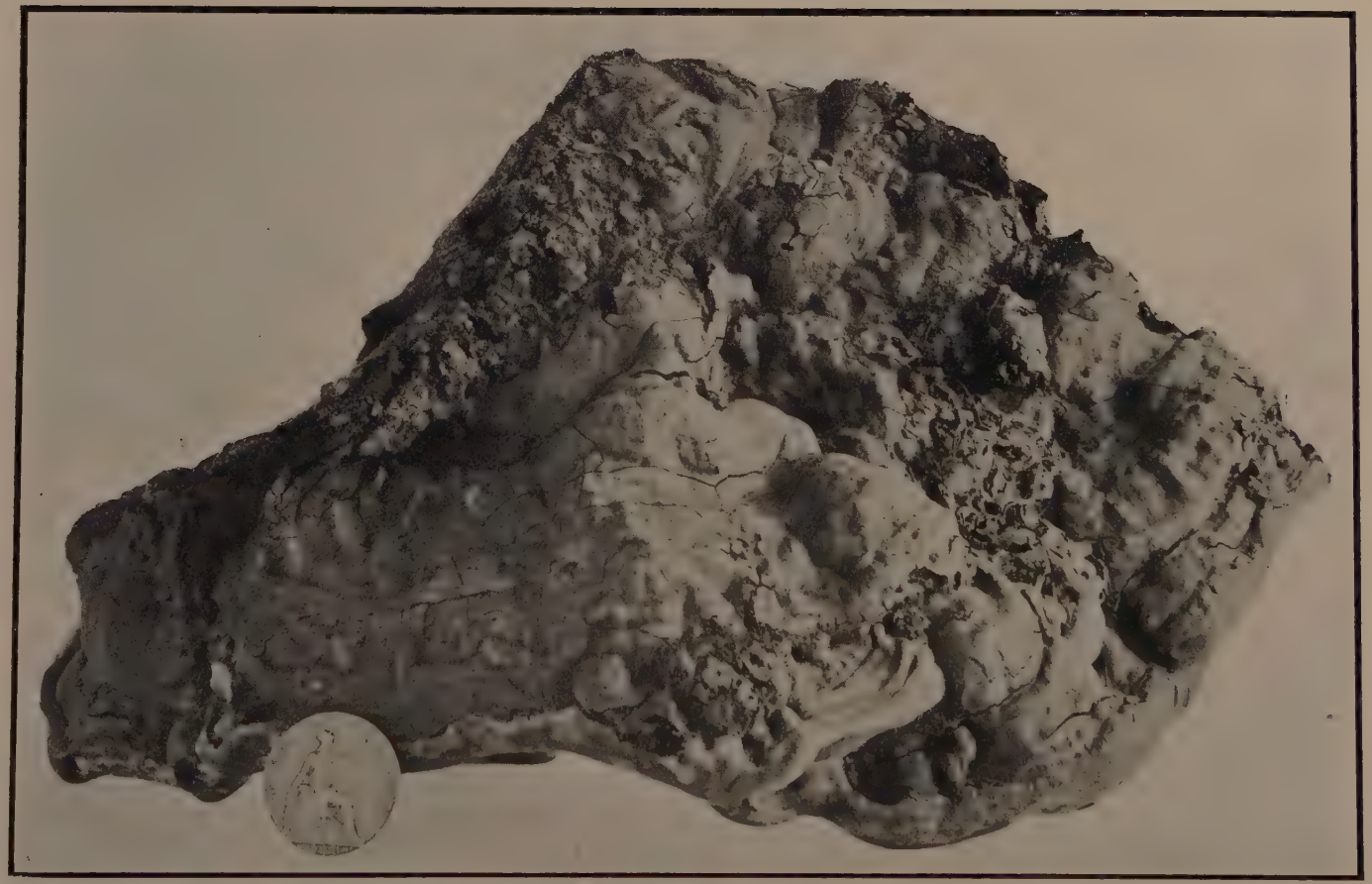


Plate VI.

Fomes applanatus, var. *australis*. Upper surface.

Plate VII.

Fomes applanatus, var. *australis*. Under surface showing pores.

Plate VIII.

Heart-wood of *Acacia horrida*, permeated with the mycelium of *Fomes applanatus*, var. *australis*.

(*a*) (*b*)

Plate IX.

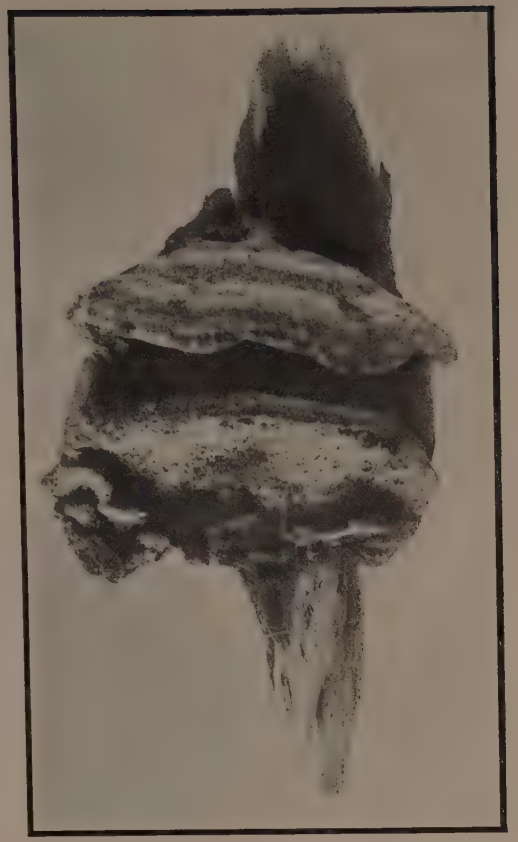
Cross-section of trunk of *Banksia ericifolia* permeated by the mycelium of *Fomes robustus*. The sporophore seen *in situ* in (*b*).

(*a*)

(*b*)

Plate X.

Polyporus dryadeus. (*a*) Upper surface ; (*b*) in section.



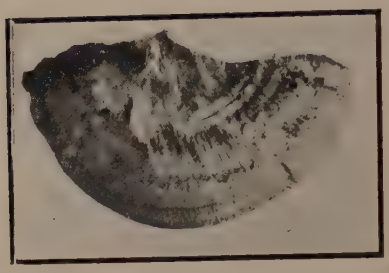
(*a*)

Polyporus gilvus.

(*b*)

Plate XI.

Polyporus dryadeus. Under surface showing pores.



(*a*)

(*b*)

Plate XII.

(*a*) *Polyporus ochroleucus.* Upper surface.
(*b*) *Fomes applanatus.* Upper surface.

Plate XIII.

Polyporus eucalyptorum from a "Blackbutt" (*Eucalyptus pilularis*).

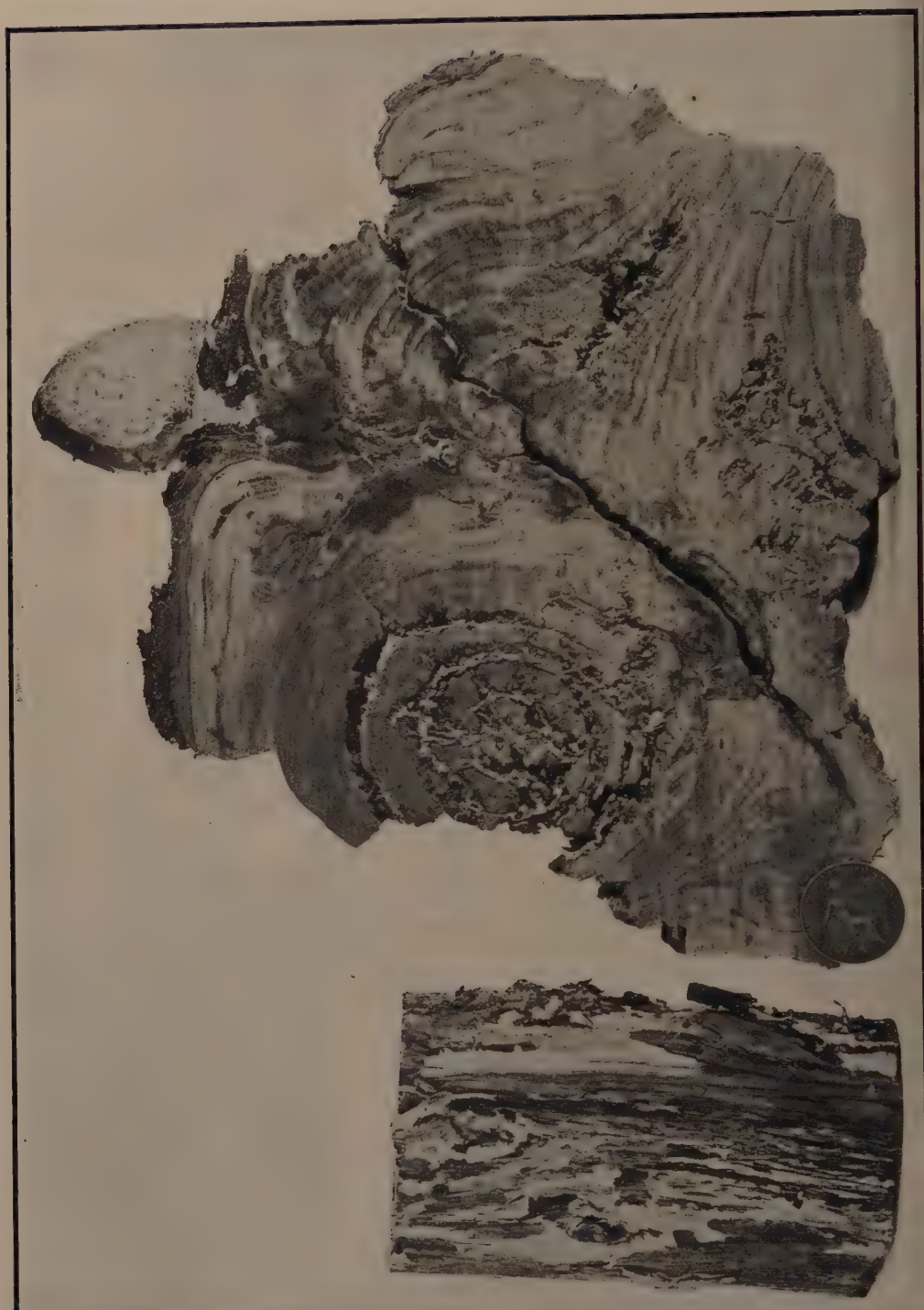


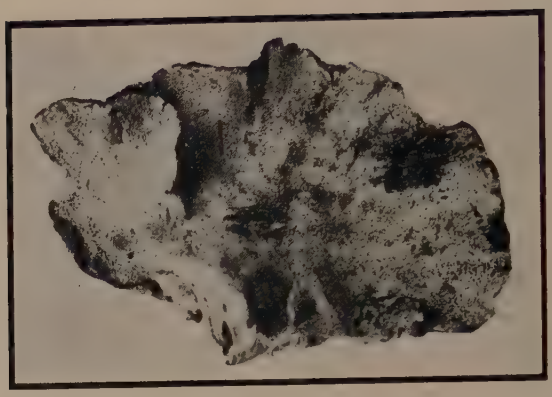
Plate XIV.

Polyporus eucalyptorum. Sporophore *in situ* and permeation of the timber of *Eucalyptus capitellata* with the sheets of white felt-like mycelium.

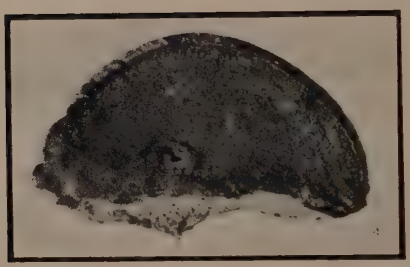
Plate XV.

Wads of felt-like sterile mycelium, probably of *Polyporus eucalyptorum*, from the heart-wood of a stringybark (*Eucalyptus* sp.).

(*a*)



(*b*)



(*c*)

Plate XVI.

(*a*) *Polyporus salignus.* Upper surface.
(*b*) *Polyporus ochroleucus.* Under surface showing the pores.
(*c*) *Polystictus versicolor.* Under surface showing the pores.

Plate XVII.

Polystictus versicolor on a branch.

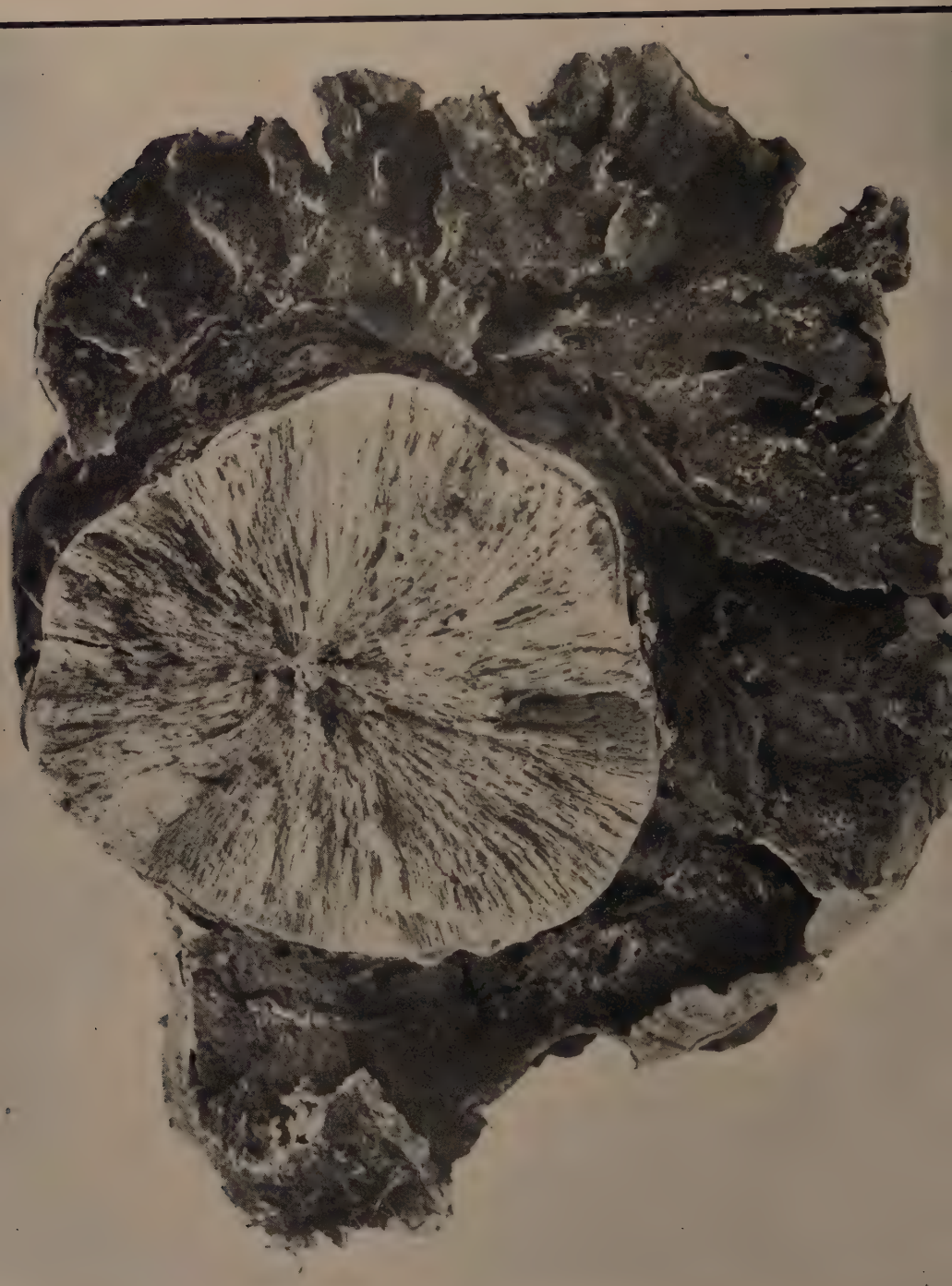


Plate XVIII.

Section of the Branch of a Tree, showing the rotting of the timber caused by *Polystictus versicolor*.

Plate XIX.

Trametes lactinea. Upper surface.

Plate XX.

Trametes lactinea. Under surface showing pores.